Albemarle County

Chesapeake Bay
TMDL Action Plan
(DRAFT)

submitted as partial fulfillment
in meeting
Special Condition (Section 1C) of the
2008 – 2013
VPDES General Permit for
Small Municipal Separate Storm Sewer Systems
VAR040074

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Introduction

Albemarle County is responsible for contributing to the restoration of the Chesapeake Bay through the planning and implementation of activities to reduce the discharge of pollutants of concern (POC) to local waters. The extent of required local efforts is dictated by the Special Condition for the Chesapeake Bay TMDL in General Permit No. VAR040074, the VPDES General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4s). Local requirements are further elucidated by Guidance Memo No. 14-2012, issued by the Department of Environmental Quality on August 18, 2014, and the draft revision of this memo dated March 19, 2015.

Virginia's Phase I and Phase II Watershed Implementation Plans (WIPs) require that operators of MS4s achieve the following pollutant reductions over a period of three five-year permit cycles:

pollutant	reduction from *impervious* regulated areas	reduction from *pervious* regulated areas
nitrogen	9%	6%
phosphorus	16%	7.25%
sediment	20%	8.75%

MS4s are permitted to achieve these reductions incrementally over time, per the following schedule:

permit cycle (years)	% implementation required
1st (2013 – 2018)	5%
2nd (2018 – 2023)	35%
3rd (2023 – 2028)	60%
total	100%

This Action Plan includes a summary of the Special Condition and DEQ guidance as they pertain to Albemarle County, summaries of the computations and results quantifying the POC reduction requirements, descriptions of the analytical methods used, and an examination of the projects and practices that will contribute towards providing compliance with the POC reductions required during the first permit cycle.

In general, spatial analyses were performed using ArcGIS and computations were done in Microsoft Excel.

MS4 Regulated Area

Chesapeake Bay pollutant reductions have been assigned to Albemarle County through its MS4 permit and apply only to the MS4 regulated area. The determination of the size and extent of the regulated area is a critical step in the action planning process. Regulated area (or regulated *land*) – as it pertains to Phase II MS4s – is defined as "the conveyances and drainage area [served by the MS4] that falls within a Census Designated Urbanized Area"[1].

US Census-Designated Urban Areas

The MS4 regulated area is primarily based on the boundaries of Urban Areas (UAs) as defined by the U.S. Census. The general permit indicates that the 2000 UA shall be used to determine the POC loading rates and reductions required during the first permit cycle (2013 – 2018)[2]. For all subsequent permit cycles, the 2010 UA must be used to calculate POC loading rates and removal requirements[3]. The intent of this directive is to give MS4s sufficient time to adapt to the increase in pollutant reduction requirements associated with a *presumed* expansion of the extent of the UA.

However, while the Albemarle County UA expands from 2000 to 2010 in some areas, it contracts in other areas and there is actually a net decrease in the size of the Albemarle County UA over this period. Because Albemarle will not be required to adapt to a significant UA expansion and in order to simplify the Action Planning process over time, the County will use the 2010 UA for this and subsequent permit cycles. DEQ has indicated that Albemarle County may base its MS4 regulated area using the 2010 UA boundary without consideration of the 2000 boundary[4].

Areas Served by the MS4

Guidance provides that an MS4 is a conveyance or system of conveyances 1) owned or operated by a county or other public body and 2) designed or used for collecting or conveying stormwater[5]. Based on this guidance and the definition of regulated area, areas not draining into the operator's MS4 may be excluded from its regulated area.

Albemarle County has not historically borne responsibility for maintaining conveyance infrastructure outside of County-owned properties. However, the County recently reconsidered this issue and concluded that it will, as a matter of policy, begin assuming responsibility for the operation of conveyance infrastructure on private properties if the infrastructure lies within a public easement. The County does not presently know the full extent and location of this public conveyance infrastructure so it is not possible at this time to determine whether lands within the 2010 UA are served by the County's MS4. Consequently, the County will suppose – for the 1st-cycle Action Plan – that *all* private lands within the 2010 UA could potentially be served by the MS4. Nonetheless, the County reserves the right – as

[1] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 1

[2] 9VAC25-890-40 (General Permit) Section I.C.2.a.(5)

[3] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 3

[4] conveyed via telephone conversation with Jaime Bauer on February 2, 2015, 9:00AM

[5] 9VAC25-870-10 (Definitions)

part of future Action Planning – to refine the MS4 regulated area based on information collected in the course of mapping the storm sewer system.

Areas Not Included in Albemarle MS4

The MS4 regulated area is further refined by removing lands on which stormwater management is the responsibility of other parties[6]. These lands include:

1) Other MS4 Jurisdictions
    a) The University of Virginia (UVA)
    b) Virginia Dept. of Transportation (VDOT)
    c) City of Charlottesville-owned properties in the County
    d) Piedmont Valley Community College (PVCC)
2) General VPDES-Permitted Sites
    a) Republic Services of Charlottesville
    b) Moores Creek Regional STP
    c) Charlottesville-Albemarle Regional Airport
    d) Northrop Grumman Systems Corporation

In addition, County-owned properties within the City of Charlottesville – for example, the downtown County Office Building and several schools – are *added* to the Albemarle County MS4 regulated area.

Additional information on lands not included are provided in Appendix B, tab "2009 Land Use".

Forested Lands

Lastly, forested lands are removed from the MS4 regulated area because they are not assigned a loading in the Chesapeake Bay Model[7]. Any forested lands excluded from the MS4 regulated area were also excluded from the load reduction calculations for individual BMPs as part of considering new and grandfathered sources.

The identification of forested lands within Albemarle County's regulated area was based on a local land cover map developed in 2009 in partnership with the Rivanna River Basin Commission, The Nature Conservancy, and the Thomas Jefferson Soil and Water Conservation District. This map includes land cover classifications for deciduous forest, evergreen forest, open space, impervious area, and water. The land cover map has a relatively fine resolution (1-foot) so it was necessary to differentiate between an actual urban forest and small clusters of trees which would not act as a true forested area – such as a cluster of trees within a commercial parking lot or residential area. This was accomplished by setting a minimum 25-foot pervious buffer around all impervious surfaces – buildings, roadways, driveways, and parking lots – and then establishing a minimum contiguous area threshold of 0.5-acres[8] for land cover identified as forested to qualify as "forested lands" in the context of the MS4. These forested lands

[6] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 5

[7] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, page 4

[8] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 5

were not included in existing source load calculations, new source load calculations, or any onsite BMPs reduction calculations.

Summary of Regulated Area Calculations

Based on the descriptions above, the County used ArcGIS to designate the MS4 regulated area and classify and quantify the land uses, as summarized in the following table:

	total area (ac)	
2009 land use	**regulated**	**unregulated**
pervious	5,488	-
impervious	2,045	-
forest	0	5,976
total:	**7,533**	**5,976**

These areas are depicted in the 36 x 48-inch map included as part of this draft Action Plan, and the GIS methodologies are summarized in Appendix A.

Required Pollutant Reductions

The County must reduce POCs discharged from the following categories of sources within the MS4 regulated area:

1. existing – generally based on land cover as of June 30, 2009
2. new – generally based on changes to land cover between July 1, 2009 and June 30, 2014
3. grandfathered – generally based on changes to land cover occurring after July 1, 2014 but permitted under old stormwater management requirements

Although MS4s are responsible for addressing only five percent of the total required pollutant reductions during the 1st permit cycle, the calculations presented in the following sections are for the long-term total (100%) required load reductions, unless otherwise noted.

All required pollutant reduction calculations for existing and new sources can be found in the Appendix B spreadsheet, which includes the following worksheets:

- Existing Source Load Red. – calculates the POC reduction requirements for existing sources based on Tables 2 and 3
- 2009 Land Use – describes the regulated and unregulated land area totals and provides details on lands not included in the regulated area
- New Source Load Red. – calculates the POC reduction requirements for new sources
- New Source Load Rational – compares DEQ's incremental efficiency method for determining POC credits for oversized BMPs described in the Draft Revised TMDL Guidance Document on page 10, to Albemarle County's POC credit method

- Efficiency Table Overview – summarizes the efficiencies used to determine the new source onsite BMP reductions using the Virginia Stormwater Management Handbook 1999, also summarizes the Chesapeake Bay Program established efficiencies and the Clearinghouse/VA SWM Handbook 2013 nutrient efficiencies
- POC Accounting Overview – summarizes the POC reduction requirements and BMP credits accounted to date
- Efficiency Lookup – used as a lookup table for Column "T" in the "New Source Load Red." worksheet

Existing Sources

Existing sources are characterized as urban pervious and impervious areas within the MS4 regulated area as of June 30, 2009. As previously described, contiguous forested areas outside of the 25-ft impervious surface buffer and over 0.5-acres in size are not included as urban pervious but are classified as unregulated.

The estimated POC loads from existing sources are simply a function of the amounts of regulated pervious and impervious areas and loading rates specified in Table 2 of the General Permit:

Existing POC Loads based on Table 2a of the General Permit				
Subsource	**Pollutant**	**Total Existing Area Served by MS4 (ac)**	**2009 EOS Loading Rate (lbs/ac-yr)**	**Estimated Total POC Load (lbs/yr)**
Regulated Urban Impervious	Nitrogen	2,045	9.39	19,203
Regulated Urban Pervious		5,488	6.99	38,361
Regulated Urban Impervious	Phosphorus	2,045	1.76	3,599
Regulated Urban Pervious		5,488	0.5	2,744
Regulated Urban Impervious	Total Suspended Solids	2,045	676.94	1,384,342
Regulated Urban Pervious		5,488	101.08	554,727

Required pollutant reductions for existing developed lands are intended to meet the Level 2 (L2) scoping run of the Chesapeake Bay Model. The total POC reductions – in pounds/acre-year – are derived by multiplying the percent reductions by the loading rates, as follows. These total reductions are then translated into the incremental reductions for each permit cycle.

Subsource	POC	VA WIP reduc-tions	2009 EOS Loading Rate (lbs/ac-yr)	Required Reductions (lbs/ac-yr)				
				Total (2013 – 2028) 100%		1st-cycle (2013 – 2018) 5%	2nd-cycle (2018 – 2023) 35%	3rd-cycle (2023 – 2028) 60%
Regulated Urban Impervious	N	9%	9.39	0.85		0.04	0.30	0.51
Regulated Urban Pervious		6%	6.99	0.42		0.02	0.15	0.25
Regulated Urban Impervious	P	16%	1.76	0.28		0.01	0.10	0.17
Regulated Urban Pervious		7.25%	0.5	0.04		0.002	0.01	0.02
Regulated Urban Impervious	TSS	20%	676.94	135.39		6.77*	47.39	81.23
Regulated Urban Pervious		8.75%	101.08	8.84		0.44	3.10	5.31

*Note that this value is not consistent with that from Table 3a; it is assumed that 6.77 is the correct value.

The required pollutant reductions are calculated in pounds per year by multiplying by the load reductions from the above table (in pounds per acre -year) by the corresponding amounts of regulated pervious and impervious areas. The table below summarizes Albemarle County's total required reductions (through the end of the 3rd permit cycle) from existing sources for the POCs.

Required POC reductions based on Table 3a of the General Permit					
Subsource	Pollutant	Total Existing Area Served by MS4 (ac)	Total Required Reduction in Loading Rate (lbs/ac-yr)	Total Reduction Required 1st – 3rd Cycle (lbs/yr)	
Regulated Urban Impervious	Nitrogen	2,045	0.85	1,738	4,043
Regulated Urban Pervious		5,488	0.42	2,305	
Regulated Urban Impervious	Phosphorus	2,045	0.28	573	792
Regulated Urban Pervious		5,488	0.04	220	
Regulated Urban Impervious	Total Suspended Solids	2,045	135.39	276,873	325,386
Regulated Urban Pervious		5,488	8.84	48,514	

Calculations for the above tables are provided in Appendix B, tab "Existing Source Load Reductions".

New Sources

Albemarle County is required to consider new sources of pollutants under Special Condition 7 because – prior to the adoption and local implementation of the VSMP on July 1, 2014 – the County used an average land cover condition of 20% impervious cover for the design of post-development stormwater

management facilities for land development within the regulated area[9]. This condition applies to development initiating construction between July 1, 2009 and June 30, 2014 that disturbs one acre or greater.

It should be noted that, while the County used a more lenient average land cover condition for development in the urban areas, other intricacies in the local rules sometimes resulted in more stringent overall local standards. For instance, Albemarle's *modified* simple method formula utilized flow-weighted mean phosphorus concentrations greater than the required Virginia value of 0.26 mg/L. This is discussed in more detail in the following section.

The County identified new sources using two methods:

1. Comparison of County GIS planimetric data approximating July 1, 2014 land cover to the county-wide 2009 land cover map.
2. Analysis of County database files for approved site plans, subdivisions, and other land disturbing activities.

These two data sources were reconciled to develop a single listing of new sources. The locations of these developments – and delineation of new impervious areas – are depicted on the included 36 x 48-inch map. The development characteristics are summarized within the spreadsheet (Appendix B, tab "New Source Load Red.").

Albemarle County calculated required load reductions from new sources on a site-by-site basis through use of the simple method[10,11]. This method estimates phosphorus load as a function of the average annual precipitation for Virginia, the site's percent impervious cover and drainage area, and an estimated flow-weighted mean phosphorus concentration.

Pollutant generation and reduction information is often provided on the approved engineering site plans. However, to maintain consistency in calculating loadings and reductions and to avoid any errors embedded with the site plans, the County re-calculated these values using basic, measurable data from the site plans, including drainage area, imperviousness, and BMP characteristics.

Using the simple method, the Albemarle County site-by-site spreadsheet computations account for:

- the *increase* in pollutant loads which must be mitigated due to new development – typically a conversion of regulated pervious area to impervious areas

[9] 9VAC25-890-40 (General Permit) Section I.C.2.a.(7)
[10] Virginia Stormwater Management Handbook Volume II, P. 5-95
[11] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 4

- the pollutant *reductions* provided by the onsite stormwater management constructed as part of the new development

The increased phosphorus load due to new sources is computed by comparing the actual post-development phosphorus load to the *allowable limit*, defined as the greater of 1) the pre-development phosphorus load and 2) the phosphorus load based on a 16% impervious average land cover condition. The difference between the actual post-development load rate and the allowable limit is considered to be the *pollutant load to mitigate*. The multipliers presented in Table 4 in the general permit are used to determine the equivalent loads to mitigate for TN and TSS.

Subsequently, the load reductions from onsite BMPs were calculated based on the post-development loading rate and phosphorus reduction efficiencies from the 1999 Virginia Stormwater Management Handbook. Efficiency details are summarized in Appendix B, tab "Efficiency Table Overview". The multipliers presented in Table 4 in the general permit are used to determine the equivalent BMP reductions for TN and TSS. If a project included multiple BMPs, the reductions from each BMP were added to get a *total load reduction* from the site. BMPs in series were addressed by considering the effect of pollutant reductions due to upstream BMPs.

The total load reduction for each POC was then subtracted from the pollutant load to mitigate to determine a net POC offset required for each project. The net offset required for each project was then added to calculate a total offset required for all new sources.

The calculations for each new development site can be found in Appendix B, tab "New Source Load Red.". Some headings contain embedded comments with a description of the column.

Factors Affecting Pollutant Reduction Calculations

Per Albemarle County requirements at the time, the BMPs constructed as part of the new developments were designed to reduce POC loads to that of an average land cover condition of 20% imperviousness. While this is less stringent than the State's 16% land cover condition, the County had certain requirements which were *more* stringent than State requirements. Albemarle County approved site plans typically using a flow-weighted mean pollutant concentration of 0.7 mg/L for development areas, 0.35 mg/L for drinking water watersheds, and 0.4 mg/L for agricultural areas[12] while the Virginia Stormwater Management Handbook required the use of a flow-weighted mean pollutant concentration of only 0.26 mg/L, regardless of land use.

In addition, the County found that most BMPs were over-designed relative to the local requirements, primarily because the selected BMP pollutant reduction efficiencies usually exceeded those necessary to exactly meet the requirement. For example, if a developed site required a 57% phosphorus reduction to comply with the County's 20% impervious average land cover condition, the designers may have

[12] https://www.albemarle.org/upload/images/forms_center/departments/community_development/forms/design_standards_manual/Albemarle_County_Design_Standards_Manual_22Oct2012.pdf page 8.

selected a Wet Pond providing a 65% phosphorus reduction, thus resulting in a phosphorus reduction which was 8% beyond the County's requirements for that site. In most cases, this over-design of BMPs in addition to the stricter requirements for flow-weighted mean pollutant concentration more than compensates for the difference in the County and State average land cover conditions.

Further, some of the BMPs were purposefully built to treat existing offsite development, which the County intends to count toward its load reduction requirements.

DEQ guidance allows use of a simplified accounting procedure to calculate POC removal from oversized BMPs[13]. In this method, permittees are directed to take the difference between the percentage of TP reduction required for onsite VSMP compliance and TP efficiency provided by the BMP. That difference in efficiency is then to be multiplied by the total TP, TN, and TSS load to determine credit available as a result of that oversized BMP. However, the County found that this simplified method under-accounts for the actual load reduction provided in cases where an oversized BMP's drainage area is greater than the disturbed area. In these cases, the incremental efficiency method does not account for the BMP's ability to provide full treatment to offsite drainage beyond onsite VSMP requirements. As a result, the County used the methods described in the previous paragraphs to account for nutrient removal credit from oversized BMPs receiving offsite drainage from existing sources. These two methods are compared in the accounting spreadsheet developed by Albemarle County (Appendix B, tab "New Source Load Rational").

Based on the accounting spreadsheet developed by Albemarle County (Appendix B, tab "New Source Load Red."), the increased POC load from new sources within the County's regulated area is 265.1 pounds of phosphorus per year. However, BMPs installed at these new source locations yielded a reduction of 377.0 pounds of phosphorus per year. This results in a 111.9 pound net credit for phosphorus offsets for new sources. Calculations for all POCs are summarized in a section below.

Special Situations

Through the process of determining the required nutrient reductions from new sources of pollution, Albemarle County found additional development scenarios beyond those described in Situations 1-4 in the guidance document[14]. Appendix C describes each of the additional situations, the pollutant reduction accounting, and the pollutant load computation description. Column AD in Appendix B, tab "New Source Load Red." lists any relevant special situations for each new development.

The most common scenario is Special Scenario #1 in Appendix C, "Land in Transition". Since development occurs over time, the commencement and completion of developments considered to be new sources do not fall neatly within the July 1, 2009 to June 30, 2014 time frame. Based on DEQ guidance, developments having the majority of construction taking place during the new sources time frame but either commencing construction prior to July 1, 2009 or completing construction after June

[13] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 10

[14] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 26-35

30, 2014, are considered "in transition" and are included in the new source load calculations. Any development that occurred prior to July 1, 2009 is not included in the existing source load calculations[15].

scenarios for lands in transition	construction commencement	construction completion	how these were addressed
1	before July 1, 2009	July 1, 2009 – June 30, 2014	included as new source; pre-construction land use used for computing existing sources
2	July 1, 2009 – June 30, 2014	after June 30, 2014	included as new source; full development build out estimated
3	before July 1, 2009	after June 30, 2014	pre-construction land use used for computing existing sources and full development build out estimated

Summary of Pollutant Loading Balance

Based on preliminary calculations, Albemarle County's long-term (100%) pollutant loading increases and reductions are as follows:

Pollutant Loading Balance	**P**	**N**	**TSS**
loadings to be mitigated (lbs/yr)			
existing sources	792	4,043	325,386
new sources	264	1,374	111,245
grandfathered sources			
total reductions required	**1,056**	**5,408**	**436,631**
reductions achieved (lbs/yr)			
new source BMPs	379	1,972	159,620
grandfathered source BMPs			
total County projects (means and methods)			
total reductions achieved	**379**	**1,972**	**159,620**
% of total reduction achieved	**36%**	**36%**	**37%**
remaining reductions (lbs/yr)	**677**	**3,436**	**277,012**

As indicated, Albemarle County has already exceeded its 5% pollution reduction requirement during the first permit cycle.

[Conclusion of April 2015 draft submittal]

[15] Chesapeake Bay TMDL Special Condition Guidance Memo No. 14-2012, draft revision 3/19/2015 page 6

APPENDIX A: GIS Processes

Section 1: Files Included in Geodatabase

Boundary Files (Section 2 below):

- **AlbCo_2010_MS4_Boundary** – This is the total MS4 Boundary for Albemarle County based on the 2010 Census designated Urban Area with Charlottesville, Charlottesville Parcels within the County, UVA, and PVCC removed (2010_Alb.Co._MS4_Jurisdictional_Boundary.shp in section 2)
- **A_Charlottesville_MS4_Boundary** – Most current Charlottesville MS4 Boundary removed from Albemarle County's MS4 Boundary.
- **A_CharlottesvilleOwnedProperties_within_County**- These are the parcels that lie within the County's MS4 Boundary that are owned by Charlottesville and therefore included in their MS4 and excluded from the County's MS4. Agreed on by both the County and City.
- **A_UVA_Boundary**- The boundary of University of Virginia's MS4 system.
- **A_PVCC_Boundary**- The parcel boundary of Piedmont Valley Community College that is excluded from the County's MS4 Jursidiction.
- **A_MS4_VDOT**– Estimated VDOT MS4 system excluded from the County's MS4 system VDOT MS4 (Section 3 below)

Existing Sources - 2009 Land Use Data (Section 4 below):

- **B_2010_RA_2009_eVDOT_LandUse_FINAL** – This is the 2009 land use file including all land uses within the 2010 Census Urban Area with the estimated VDOT MS4 taken out. (Section 3)
    - ID 1 = Unregulated Forest
    - ID 2 = Open Area (pervious cover)
    - ID 3 = Water
    - ID 4 = Impervious cover
- **B_2010_RA_2009_total_LandUse_FINAL** – Includes all of the 2009 land uses within the entire 2010 Census Urban Area and includes VDOT and VPDES sites. Follows the same ID numbering as the eVDOT file. (Section 3)

New Sources Data (Section 6 below):

- **C_2010_RA_2009_IC_InTransition** – This file contains all impervious surface considered "In Transition" or under construction as of July 1, 2009. These areas initiated construction prior to 2009, but part of a larger development mostly occurring as new sources of pollution and

therefore included as new sources and pre-development conditions are used as baseline for existing sources.

- **C_2010_RA_NewSources_SMF_Watersheds** – Contains the watersheds for all of the Stormwater Management Facilities associated with new developments used to determine the load reductions from onsite BMPs.

- **C_2010_RA_NewSources_SMFs**- Contains all of the stormwater management facilities associated with new development. Some are estimated based on site plans for developments not completed.

- **C_2010_RA_NewSources_DevBoundaries** – Contains all of the disturbed area boundaries for each of the new source sites, used to determine the increased nutrient load from new sources.

- **C_2010_RA_NewSources** – impervious surface associated with all new developments occurring between July 1, 2009 and June 30, 2014. Not all included as an increased nutrient load that needs to be offset.

    - Load_Red:

        - Yes: included as an increased nutrient load needed to be offset

        - No: not included in the increased nutrient loading calculations

- **C_2010_RA_NewSources_ToBeBuilt** – estimated impervious surface still to be built for each of the incompleted new sources of development.

Section 2: 2010 US Census MS4 Jurisdiction Boundary

- Clipped the 2010 US Census Urban Areas to Albemarle County
- Erase Charlottesville, UVA, PVCC, and Charlottesville properties within the county
- Add in the County Owned properties within Charlottesville (CountyParcels_inCville.shp) -> 2010_Alb.Co._MS4_Jurisdictional_Boundary.shp

Worked with Charlottesville to come to agreement on County owned parcels in the City and City owned Parcels in the County, as well as, the MS4 boundary to create a cohesive file.

Section 3: VDOT

- For route #'s below 600 (not 300's), let's select sde parcel ROW that intersect these roads and that yields MS4_MAJOR_RDS.
- For route #'s 600 and above – copy out the rcl to another fc (using stateplane us feet as the output coordinate system). For records in rcl copy that have blank/NULL/0 values for VDOT_PAVEMENT_WIDTH_MSR field, plug in 15. Add a buffer field and calc it to be ½ the

VDOT_PAVEMENT_WIDTH_MSR. Buffer this fc (use FLAT parameter) using that new field. à VDOT_MINOR_RDS_BUFFER.

- Take VDOT_MINOR_RDS and buffer (use ROUND parameter) by an amount that's larger than the pavement width and cul-de-sac areas (200 FT) to make VDOT_MINOR_RDS_BUFFER_200. Then clip VDOT_MINOR_RDS_BUFFER_200 by the roads_poly to yield VDOT_MINOR_RDS_CLIPPED.
- Take rcls PVT and buffer (use FLAT parameter) by a an amount that's not too big and not too small b/c we're just trying to the buffer to be just a little outside the the roads_poly layer (30 FT) to make PVT_RDS_BUFFER_30. Then clip PVT_RDS_BUFFER_30 by the roads_poly to yield PVT_RDS_CLIPPED.
- Erase PVT_RDS_CLIPPED by VDOT_MINOR_RDS_BUFFER to yield PVT_RDS_CLIPPED_ERASED
- Erase VDOT_MINOR_RDS_CLIPPED by PVT_RDS_CLIPPED_ERASED to yield VDOT_MINOR_RDS_CLIPPED_ERASED.
- Explode VDOT_MINOR_RDS_CLIPPED_ERASED to VDOT_MINOR_RDS_CLIPPED_ERASED_EXPLODED and copy out the features that intersect VDOT_MINOR_RDS to yield VDOT_MINOR_RDS_CLIPPED_ERASED_EXPLODED_INTERSECT.
- Copy VDOT_MINOR_RDS_CLIPPED_ERASED_EXPLODED_INTERSECT to fc called MS4_VDOT_UNDISSOLVED.
- Merge VDOT_MINOR_RDS_BUFFER into MS4_VDOT_UNDISSOLVED. This allows for some medians and some other girthiness to be accounted for.
- Merge MS4_MAJOR_RDS into MS4_VDOT_UNDISSOLVED.
- Dissolve MS4_VDOT_UNDISSOLVED into MS4_VDOT_UNCLIPPED.
- Clip MS4_VDOT_UNCLIPPED by MS4 boundary to yield **MS4_VDOT_FINAL**.

A python script was created and run so the process can be replicated when VDOT takes ownership of newer infrastructure. There are 3 parcels that mess up the file and have to be manually edited out after the script is run, this will be reconciled in the future.

Section 4: 2009 Land Cover

- Clip 2009 Land Cover to the 2010 MS4 Jurisdictional Area -> 2009_LandUse_MS4Boundary.shp
- Extract out each of the land uses:
    - Impervious Cover = Baseclass 4
    - Water = Baseclass 3
    - Pervious Cover = Baseclass 2
    - Forest = Baseclass 0/1
- Impervious Cover: Use 2014 Impervious cover and remove new sources file to create the 2009 impervious cover file. Add in the 2009 impervious cover removed for new sources to get full picture of 2009 land use.
    - 2014 impervious surface erase new source file -> 2014_IC_erase_New_tomake_2009IC.shp

    - Erase IC in transition (2009_IC_InTransition.shp section 4) from 2014_IC_erase_New_tomake_2009IC.shp -> 2009_IC_erase_InTransition.shp **(**some manual edits needed)
    - Append 2009_IC_removed.shp -> 2009_IC_erase_append_ICremoved.shp
    - Dissolve -> **2009_IC_total.shp**
    - Create a 25ft buffer around all impervious surfaces and dissolve -> 2009_Impervious_BUFF25.shp
    - Erase 2009_IC_total.shp and add buffer to pervious surface.
- Pervious Cover: dissolve impervious and pervious land cover into one file. Make baseclass = 2 and then erase the created impervious cover file from 2014 data.
    - Extract pervious and impervious cover (baseclass 2 and 4) from the land use file. -> 2009_Impervious_and_openspace.shp
    - Dissolve to create a cohesive open space shapefile -> 2009_Impervious_and_openspace_dissolve.shp
    - Erase the 2009 Impervious cover -> 2009_pervious.shp
    - Erase and then append -> 2009_Impervious_BUFF25andlessthan0.5acres.shp
    - Clip to MS4 boundary and dissolve – **PERVIOUS_RECREATED_Dissolve.shp**
- Forest:
    - Dissolve Forest layer
    - Erase
    - Explode file to create distinct features
    - Recalculate area and select features under 0.5 acres -> export and remove features from forest layer and add them the 2009_impervious_BUFF25 shapefile – 2009_Impervious_BUFF25andlessthan0.5acres.shp
    - Erase 2009_Impervious_BUFF25andlessthan0.5acres.shp from the forest layer.
        - 2009_Total_Unreg_Forest.shp
- All land cover:
    - Copy 2009_IC_total.shp and rename -> **2010_RA_2009_total_LandUSe_FINAL.shp**
        - Make sure ID = 4
    - Append 2009_pervious_total.shp (test)
        - Make sure all pervious ID = 2
    - Append Water layer (no test)
        - Select all ID = 0 and calculate field = 3
    - Append 2009_Forest_UnReg_FINAL.shp (no test)
        - ID = 1
    - Calculated geometry for Area (acres)
    - Erase MS4_VDOT_FINAL.shp – **2009_eVDOT_LandCover_FINAL.shp**

Section 5: 2014 Land Cover

- Impervious

    - 2014 Impervious layers merged and clipped to Combo MS4 Jurisdictional Area -> 2014_IC_merge.shp
        - Roads_Poly
        - Buildings
        - Driveways
        - Road_Bridges
        - Railroads- buffered by 10 ft and dissolve
    - Add in the impervious surface for the County owned parcels within the City of Charlottesville.
    - Clip to Alb. Co. MS4 Jurisdiction final -> 2014_IC_Merge_clipto_MS4boundary.shp
    - Erase new sources built between 2009 and 2014 ->2014_IC_merge_eraseNew.shp
    - Erase Existing IC removed (2009_IC_removed -do not use Existing_IC_Removedfor_newdevelopment) for New Development -> 2014_IC_merge_eraseNewRemoved.shp
    - Append the **new sources** file to collect all of the manual edits done to the new source shapefile and the "**in transition"** impervious cover file-> 2014_IC_merge_eraseNewRemoved_append.shp
    - Dissolve -> **2014_IC_Total.shp**
- Pervious:
    - Merge 2009_impervious_and_openspace_dissolve.shp and 2009_regulated_forest.shp - > 2014_pervious_merge.shp
        - Calculate ID = 2
    - 2014_pervious_merge.shp and erase 2014_IC_total.shp-> 2014_pervious_ erase.shp
    - Dissolve -> 2014_pervious_erase_dissolve.shp
    - Export to shapefile ->
- All Land Use:
    - Copy 2014_IC_total and rename -> 2014_total_LandCover_FINAL.shp
    - Append 2014_pervious_total.shp (test)
        - Make sure ID = 2
    - Append Water layer (no test)
        - Select all ID = 0 and calculate field = 3
    - Append 2009_Forest_UnReg_FINAL.shp (no test)
        - Leave ID = 0
    - Erase VDOT -> 2014_eVDOT_LandCover_FINAL.shp

Section 6: New Source Pollutant Loads

- New impervious surfaces on the ground between July 1, 2009 and June 30, 2014.
    - 2014_IC_FINAL.shp erase 2009_IC_original.shp -> Difference_IC_2010_Census.shp
    - Manual edits to eliminate all small slivers created by a difference in GIS mapping from 2009 to 2014.
    - Added fields:

        - F-Area (acres)
        - Built_Out: yes/no to indicate if the project is completed or has more to build out.
        - Devel_Name: includes the name of the development or complex if there is one.
        - Year_Built: the year the structure was built based on the parcel data on CountyView.
        - SMF1: yes/no if there is an onsite BMP
        - SMFProName: If there is a BMP onsite, this field indicates the project name associated with the BMP, which corresponds to the Water Resources database for finished BMPs.
        - SMF_ID: The Water Resources ID number for completed BMPs.
        - Notes: any other noteworthy information.
        - Dev_Type:
            - 1 (new development)
            - 2(redevelopment)
        - Load_Red: (included or not included in the nutrient load calculations
            - Yes- included in the new source load calculations
            - No- not included in the new source load calculations.
            - Only projects over an acre of disturbed area are included as new sources.
    - Manual edits to identify and combined all parts of each development.
    - Final file -> **2010_RA_NewSources_FINAL.shp**
- Impervious cover not completed as of July 1, 2014 but part of a project initiated prior to July 1, 2014 so counted as new sources (to be built).
    - Created a shapefile and outlined future build out of the new development projects based on site plans.
    - Added fields:
        - F-Area (acres)
        - Built_Out:
            - New: Included as a new source
            - GF: grandfathered project
            - Future: possible future phase of development not included in any current calculations.
        - Devel_Name: includes the name of the development or complex if there is one.
        - Year_Built: 0 for all because not built yet
        - SMF1: If it has a proposed BMP associated with the project
        - SMFProName: If there is a BMP onsite, this field indicates the project name associated with the BMP, which corresponds to the Water Resources database for finished BMPs.
        - SMF_ID: The Water Resources ID number for completed BMPs (some of the to be built projects flow to an existing BMP).

        - Notes
        - Dev_Type: ??
    - Final shapefile -> **2010_RA_NewSources_ToBeBuilt_FINAL.shp**
- Impervious surface in transition, areas associated with new development that were in transition or under construction as of July 1, 2009, counted as new sources and not included in existing sources.
    - Created a shapefile of impervious cover captured in the 2009 impervious cover file, but really is part of a new source of pollution so is considered "in transition" and included in the new source pollutant load calculations and not as an existing source.
    - Added a field for Area and Project_Na (project name associated with development)
    - Final shapefile -> **2009_IC_InTransition.shp**
- Development Boundaries – disturbed area for each new development used to calculate imperviousness associated with the project for nutrient load calculations.
    - Created a shapefile based on the parcel shapefile for each new development that represents the disturbed area used to calculate the post-development nutrient loads.
    - Added Fields:
        - Dev_Name: includes the development or project name associated with the development.
        - F-Area: (acres)
        - Dev_Status:
            - 1 = new
            - 2 = redevelopment
        - Completed: yes/no
        - IC_Existing: Any existing Impervious surface that was onsite prior to development, possibly removed but may not be disturbed. (acres)
        - Imp_New: The new impervious surface on the ground (acres)
        - Imp_TBB: Any impervious surface to be built (acres)
        - Total_Impervious: total post-development impervious surface, taking into account any impervious surface removed for development (acres).
        - Dev_Type:
            - New
            - Grandfathered
            - Future
            - Outside RA (part of marth jeff hospital that is outside of the regulated area)
    - Final shapefile -> **2010_RA_NewSource_Dev.Boundaries_FINAL.shp**
- Existing impervious that is within the new development boundaries and/or removed for new development:
    - If there was any existing IC on the ground prior to the new development it was collected in this shapefile to determine redevelopment verses new development project for each of the new sources of pollution.

    - Final shapefile -> **Existing_IC_removedfor_newdevelopment.shp**
- Stormwater management for each new development:
    - **2010_RA_NewSource_SMFs.shp** – All of the stormwater management facilities associated with the new development projects.
        - FacilID = 01 indicates that SMF was added to the file because it is not completed or the bond is not released yet.
    - **2010_RA_NewSource_SMF_Watersheds.shp** -> All of the watersheds associated with the SMF based on the engineered site plans when available.
        - FacilID = 0 indicates the watershed was drawn in for incompleted SMFs.
    - **Existing_IC_treatedby_newSMFs.shp** -> includes all of the impervious surface counted as existing sources of pollution that is treated by a new stormwater management facility.
        - Added Fields:
            - Area (acres)
            - Notes
            - Removed:
                - No
                - Yes
                - Future – yes (impervious proposed to be removed with possible future development)

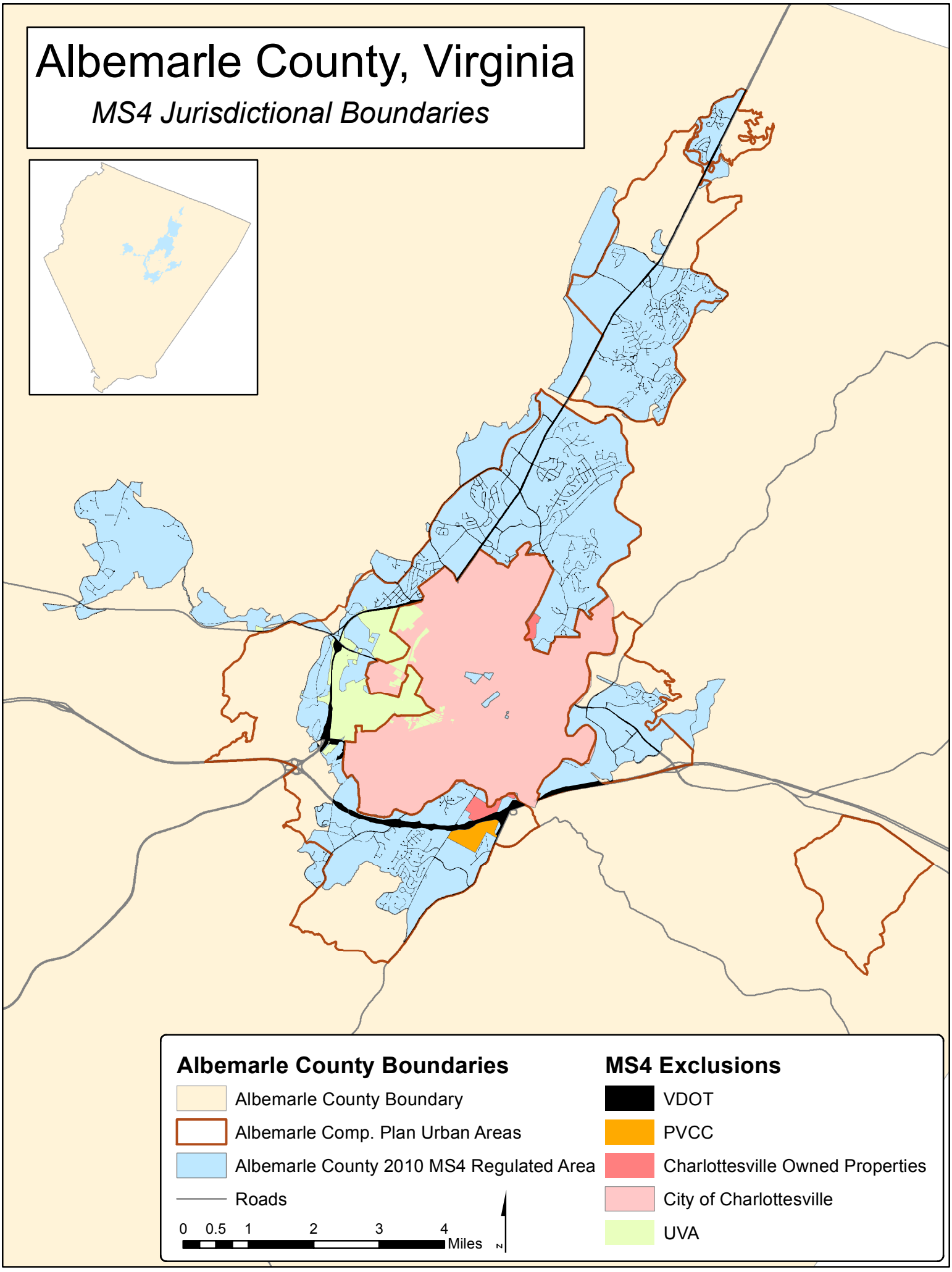
Appendix C: How Special Scenarios are Addressed in the Accounting of Pollution Reductions Offsets for New Development

Special Scenario	Description of Circumstances	Description of Pollutant Reduction Accounting	Rationale	Computation Description	Applicable Projects
1 Land In Transition	A: A new development – or a discrete phase of a larger development – is initiated prior to July 1, 2009 but not completed until after that date.	This development is considered "in transition" and the entirety is considered as a new source. Subsequently, the impervious areas existing on July 1, 2009 are not considered in the existing source computations per Section 1.C.2.a.(5).	The impervious areas are not considered as existing sources to avoid counting these areas twice – as both existing and new sources. Per DEQ guidance document page 5: "use the pre-construction land use as the baseline."	N/A	Abington Place (HTC), Avemore Phase III, Avon Park Phase I, Belvedere Phase I North, Country Green Cottages, Kenridge, Pavilions at Pantops, Martha Jefferson Hospital, Townhouses at Berkshire landing
	B: A new development – or a discrete phase of a larger development – is initiated between July 1, 2009 and June 30, 2014 but not completed until after June 30, 2014.	This development is considered "in transition" and the entire project – including estimates of areas remaining to be built – is considered as a new source.	The areas remaining to be built after June 30, 2014 are part of the permitted development and must be estimated based on the final site plan and accounted for as a new source.	N/A	Briarwood, Avemore Phase IV, Avinity, Briarwood, Dunlora Forest, Estes Park, Kenridge, Northtown Center, Stonefield, Pavilions at Pantops, Treesdale/Stonewater, Willow Glen Phase 1 and 2
2 BMP Design	A: A new BMP provides water quality treatment for existing, *offsite* sources in addition to new onsite sources.	Drainage areas for the BMP are used and existing impervious cover is included in the post development impervious cover for pollutant load calculations.	The County must consider pollutant reductions from any existing, offsite sources per Section 1.C.2.a.(5). The treatment of existing offsite sources by a private entity is given full credit for any pollutant reductions generated.	New development load reductions are calculated based on disturbed area and new impervious surface for the new development. BMP load reductions take existing offsite regulated impervious and turf cover into account for the imperviousness of the watershed.	Arden Place, Estes Park, Kenridge, Pavilions at Pantops, Treesdale/stonewater
	B: New construction contains a new BMP that drains to an existing BMP which was built for construction completed before the new source time frame.	New source loads are calculated based on changes to land use occurring between July 1, 2009 and June 30, 2014.	The entire area is new development, and SMFs were required for the entire project.	An imperviousness value is calculated for the entire BMP watershed. A smaller watershed is determined for the new development based on the new impervious surface.	Hollymead Town Center
	C: A new development includes a new BMP designed to include either grandfathered or future development.	The new development and BMP are accounted for but not the future development.	Any future development will be subject to new SW standards and must be reviewed and permitted by the County (not grandfathered). Any effect on the computations will be considered when the development is permitted.	Future development is not reflected in the "impervious area, post-dev" cell (column L).	Avinity Phase II (permitted for new regs), Avon Park Phase II, Belvedere phase II (grandfathered), Northtown Center
3 Existing Impervious Surface	A: A development has existing impervious surfaces onsite that are not disturbed for the new development, and the new development was not covered under the same construction permit as the older portion.	Calculate new source loads based on a disturbed area boundary that does not include the existing sources.	Only new sources are considered for changes to nutrient load because existing sources are already accounted for.	The disturbed area is used to calculate nutrient load increase. If the BMP was built for the new source and treats existing impervious on or offsite, then the entire drainage area is use to determine load reductions. If the BMP was built for the older portion and serves the new development, only the new development disturbed area is used in the load reduction calculations.	Avemore, Kenridge, Montgomery Ridge (new clump) Mill Creek Offices, Northtown Center, Peabody, St. Anne's-Belfield.

3 Existing Impervious Surface (cont'd)	B: A development has existing impervious surfaces onsite that are not disturbed for the new development, and the new development is covered under the same construction permit as the older portion of development.	If construction had fully stopped and then resumed as some point after 2009, the new portion is considered a new source of pollution, and disturbed area boundary does not include existing sources.	Email from Kelsey Brooks (1/26/15)	The disturbed area for the new portion is used to calculate nutrient loading and BMP reductions rates.	Bending Branch, Montgomery Ridge (old portion), Willow Lake View
	C: A development has existing impervious surfaces that will be removed for the new development.	New source loads are calculated based on changes to land use occurring between July 1, 2009 and June 30, 2014.	Per DEQ guidance Situation 2 (b)	The required pollutant load to mitigate is based on the initial load or the 16% average land cover condition, whichever is greater (column U determines which value is greater).	Airport, Avinity, Charlottesville-Waldorf, Crown BMW, Hollymead Elementary, Rivanna Plaza, Stonefield, Treesdale Park/Stonewater, Willow Glen Phase 2
4 VDOT	Roadways that are part of new development are to be dedicated to VDOT.	The VDOT roadway areas will be considered in the new sources computations.	Although the VDOT roadways and associated drainage infrastructure are not part of the County MS4, the BMPs that serve the roadways are. Any pollution reduction deficiencies or credits associated with the stormwater facilities will be accrued by the County.	VDOT roads included in post-development impervious cover.	All single family housing developments
5 MS4 Boundary	A new development is partially within the County MS4 and partially within Charlottesville's MS4, with the BMP located in Charlottesville.	No pollutant reductions are required for the County. Changes to pollutant loads are to be accounted for by the City.	BMPs in Charlottesville are designed to the 16% average land cover condition. No additional mitigation is required.	N/A	Lochlyn Hills
6 Regulated Area Border	A new development lies partially within and partially outside of the regulated area.	Only the portion within the regulated area is used to calculate required nutrient reductions, but the whole site within the BMP drainage area is used to calculate provided nutrient reductions.	The county is only responsible for offsetting new sources within the regulated area but can take credit for nutrient load reductions in the unregulated area beyond baseline requirements.	The parcel area and new impervious surface area within the regulated area are used to determine required nutrient reductions. The entire watershed and impervious surface area within and outside the regulated area are used to calculate the reductions from onsite BMPs.	Airport Runway Extension 21, Martha Jefferson Hospital
7 Unregulated Forest Area	Site contains undisturbed unregulated forested areas.	Forested areas greater than 0.5 acres are not included in the regulated area and are therefore removed from both the site area and the BMP watershed area.	Forested areas are unregulated and can't take credit for nutrient reductions unless it is included in existing load calculations.	N/A	Briarwood, Montgomery Ridge, bending branch

Albemarle County, Virginia

MS4 Jurisdictional Boundaries



Albemarle County Boundaries

- Albemarle County Boundary
- Albemarle Comp. Plan Urban Areas
- Albemarle County 2010 MS4 Regulated Area
- Roads

0 0.5 1 2 3 4 Miles

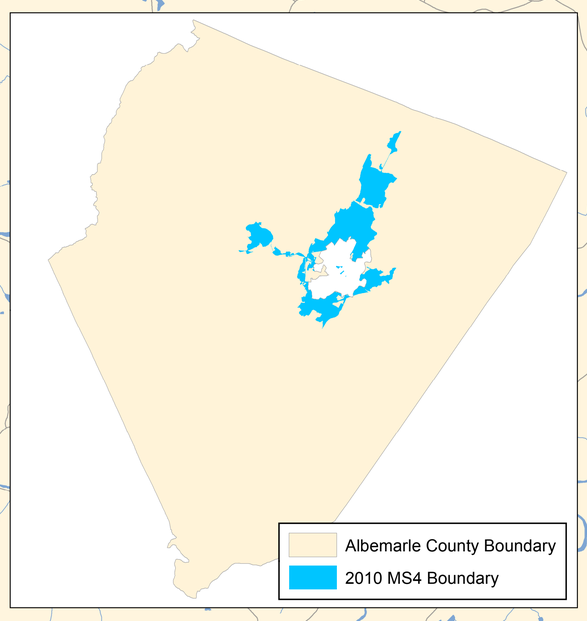
N

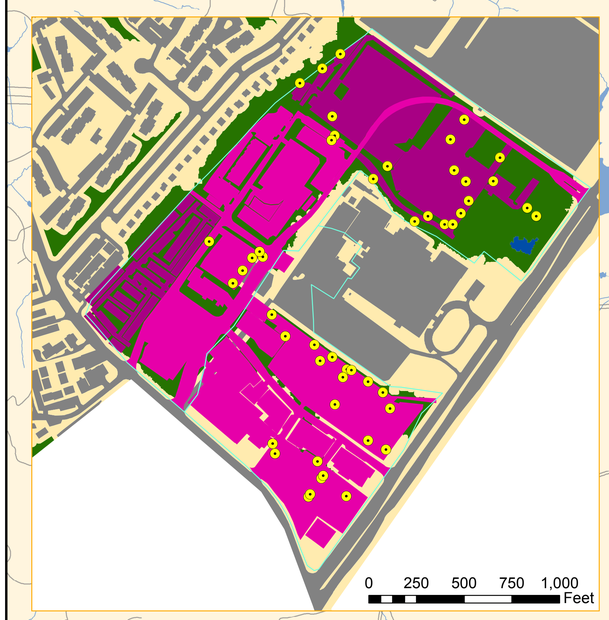
MS4 Exclusions

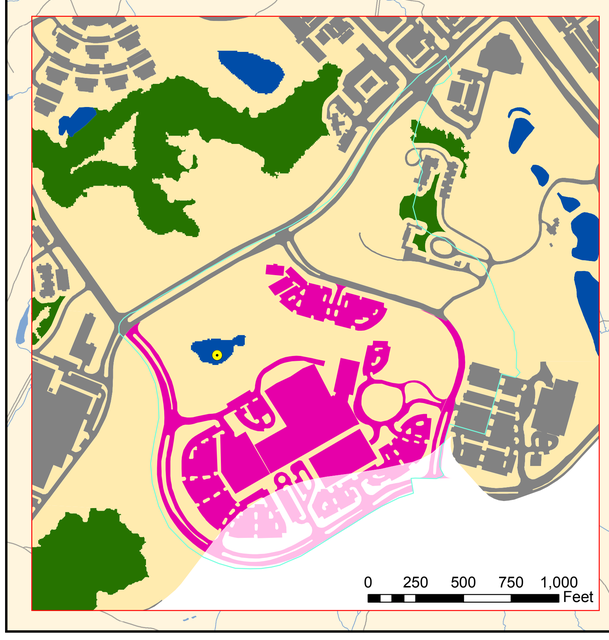
- VDOT
- PVCC
- Charlottesville Owned Properties
- City of Charlottesville
- UVA

Albemarle County, Virginia

Chesapeake Bay TMDL Action Plan
Existing Sources and New Sources







Existing Sources

(as of June 30, 2009)

- Forest
- Regulated Pervious
- Regulated Impervious
- Water

New Sources

(between July 1, 2009 and June 30, 2014)

- No Additional Reductions Required
- New Sources Built
- New Sources Estimated Build Out

Stormwater Management

(onsite BMPs for New Sources)

- Stormwater Management Facilities
- SMF Watersheds

N

0 0.1 0.2 0.3 0.4 0.5
Miles

Questions concerning Albemarle Draft Action Plan (04/01/2015):

1. **Installation Date of Existing BMPs**
   Looking over the "New Source Load Red." tab in the Appendix B spreadsheet it appears that the proposed method should not be applied to a number of the BMPs included in the spreadsheet based on the date they were initially installed:
   - BMPs installed prior to January 1, 2006 are not eligible for credit unless they are enhanced, converted, or restored. Permittees may take credit for the incremental increase in capacity for those BMPs. I believe there are at least 3 BMPs incorporated in to the spreadsheet (Bending Branch, Kenridge, Montgomery Ridge) that were installed prior to this date and are not eligible for credit.
   - BMPs installed after January 1, 2006 and before July 1, 2009 are eligible for full credit if the permittee submits to the Department a full accounting, to the maximum extent practicable, of the permittee's historic BMP implementation by September 1, 2015.
2. **TP Load Calculations using the Permit Tables**
   There is a note in cells M9-O9 of the "New Source Load Red." tab of Appendix B that the "James River EOS loading rates" were used to calculate the "average land cover, initial site conditions, actual post-dev. Conditions." We have clarified in the guidance that it is not appropriate to use the values in *Table 3a-d* for site by site TP load calculations because it will underestimate the reductions necessary to meet the VSMP regulations on those sites (once the appropriate loads for TP are determined, *Table 4* may be used to translate those loads to TN and TSS). If I have misunderstood the loading rates that were used for these cells, please let me know.
3. **Creditable TP reductions**
   This may simply be an error, but in the spreadsheet it shows that the net offset for TP is 114.93 lbs TP/yr, but in the body of the document on page 10 it states that there is a 111.9 pound net credit for TP and on page 11 the document states that "the total reductions achieved" is 379 lbs TP/yr. It is somewhat unclear which value is being reported as the total creditable reductions for the TMDL from the "new source" BMPs. If you could clarify this issue, that would be appreciated.
4. **Creditable TN and TSS reductions**
   It appears as if the associated BMP reductions for TN and TSS for each oversized BMP were calculated using the TP values and *Table 4* from the permit. If that is the case, it is not an appropriate method to use. *Table 4* should only be used to calculate the associated TN and TSS loads from the site or loads draining to a BMP, not the reductions from a BMP. We have clarified the recommended method for performing these calculations in the revised guidance document. Again, if I am misunderstanding the method that was used to estimate the associated reductions for TN and TSS from the "new source" BMPs, please let me know.